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AUSTRALIAN CARABID BEETLES VI. THE TROPICAL AND SOME SUBTROPICAL SPECIES OF *PAMBORUS*, *MYSTROPOMUS*, AND *NURUS*

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This is the first of four papers describing new flightless tropical (and a few related subtropical) Australian rain forest Carabidae of zoogeographic importance. However, these special papers will be treated as parts VI to IX of my general series on Australian carabid beetles. Some of the species now described have been referred to (but not by name) in the preceding paper of the series, on transition of wet forest carabid faunas from New Guinea to Tasmania (1961b). My localities are listed, mapped, and briefly described in No. IV of this series (1961a). The holotypes of new species described from my material are placed, at least temporarily, in the Museum of Comparative Zoology. Paratypes will be deposited with the Commonwealth Scientific and Industrial Research Organization at Canberra (where they can be compared with the Sloane Collection) and in most cases in the Queensland Museum too. In the descriptions, proportions are usually given as simple fractions ($\frac{2}{3}$, $\frac{3}{4}$, etc.) but are based on actual measurements made under the microscope.

PAMBORUS

Bänninger (1940) has correctly distinguished the real species of *Pamborus* known to him, after examining some of the older types that Sloane (1904) was unable to see. What I have to say now is mostly concerned with tropical forms unknown to Bänninger.

Three species-groups of *Pamborus* occur in tropical North Queensland. Two of them consist of single, very distinct species, *elegans* Sl. and *punctatus* n. sp., respectively. The third, which

I call the *tropicus* group, consists of a series of slightly differentiated, allopatric forms extending from South Queensland to the base of the Cape York peninsula and probably derived from a common ancestor that dispersed rather recently. Characters given in the following key to distinguish the four species (? or subspecies) of the *tropicus* group should be supplemented by comparison of descriptions and of specimens if possible.

Key to tropical species of PAMBORUS (with some subtropical species in parentheses)

1. Each elytron with 6 to 8 costae (which may be raised or nearly flat) separated by narrower crenulate intervals 2
- Elytron with 15 or more nearly equal costae 7
2. Tip of aedeagus dentate near apex; neck constriction deep; prothorax subcordate (wet forests of New South Wales and South Queensland) (*alternans*)
- Tip of aedeagus not dentate; neck constriction shallow; prothorax variable in shape 3
3. Form more convex; sides of prothorax not or slightly sinuate; 7th and 8th elytral costae usually strongly developed and not much interrupted (drier woodlands of New South Wales and South Queensland) (*viridis*)
- Less convex; sides of prothorax often more sinuate (*tropicus* group) 4
4. Elytra with costae relatively wide and weakly convex, 5th and 6th nearly as wide as 4th on disc, 7th and 8th usually distinct, but variable 5
- Elytra with costae usually narrower and more convex, 7th and 8th more often interrupted or disintegrated 6
5. Intervals between costae slightly wider and more strongly crenulate; larger (31-36 mm.) (South Queensland) (*subtropicus*)
- Intervals between costae narrower (1st reduced to a fine irregular impressed line) and less strongly crenulate; smaller (26-30 mm.) (Eungella Range) *transitus*
6. Shining (Mt. Spec to Atherton Tableland, etc.) *tropicus*
- Duller (northern Atherton Tableland to Mossman-Daintree area) *opacus*
7. Pronotum with basal impressions, not punctate; elytral costae not much interrupted; elytral margins green (Herberton—? to v. Cooktown) *elegans*
- Pronotum without basal impressions, entire surface densely coarsely punctate; all elytral costae much interrupted; bluish black (Atherton Tableland, etc.) *punctatus*

PAMBORUS SUBTROPICUS n. sp.

Form of *alternans* but often broader, somewhat variable, slightly depressed; rather shining black, pronotum with marginal channels (narrowly) and posterior impressions bluish or greenish, elytra with crenulate intervals and margins green. *Head*: neck constriction weak. *Prothorax* about $\frac{1}{3}$ (Mt. Jacob) or $\frac{1}{6}$ (Kenilworth) wider than long at middle; base slightly wider than apex; sides broadly rounded anteriorly, broadly but not strongly sinuate posteriorly; posterior angle moderately produced backward; linear basal impressions uniting with marginal channels in moderate impressions, with convex areas not or vaguely reaching posterior margin; each lateral margin with 1, 2, or 3 (number variable, sometimes asymmetrical) seta-bearing punctures near and before middle. *Elytra* with margins not serrate; each with 8 slightly elevated costae wide on disc, narrower externally and apically, separated by strongly crenulate intervals of which the 1st is narrowest but plainly crenulate; 7th and 8th costae usually distinct at least to near middle of length but not strongly raised, slightly interrupted, 8th sometimes disintegrated. Aedeagus not dentate. Length 31-33 (36); width 12 (13) mm. (figures in parentheses show probable size of an individual of which I have only elytra).

Holotype ♂ (M. C. Z. Type No. 30,346) and 1 ♀ paratype from Mt. Jacob, c. 45 miles south of Gladstone, South Queensland, March 1958; and 1 ♂ paratype from Kenilworth, west of Blackall Range, South Queensland, May 1958; all taken by myself in or on the borders of rain forest. I have also elytra of this species from Mapleton, on the north end of the Blackall Range.

See key for distinguishing characters of this species.

PAMBORUS TRANSITUS n. sp.

Form almost of rather broad *alternans*, slightly depressed; moderately shining black, marginal channels and basal impressions of pronotum without or with only slight metallic color, margins and crenulate intervals of elytra green or greenish. *Head*: neck constriction weak. *Prothorax* between $\frac{1}{6}$ and $\frac{1}{4}$ wider than long at middle; base slightly wider than apex; sides broadly rounded anteriorly, sometimes vaguely angulate at middle, broadly but weakly sinuate posteriorly; posterior angles

moderately produced backward; linear basal impressions uniting with marginal channels in moderate impressions, with convex areas sometimes reaching or nearly reaching posterior margins; each lateral margin with 1 to 4 (number variable, often asymmetrical) seta-bearing punctures near and before middle. *Elytra* with margins not serrate; each elytron with 8 slightly elevated costae very wide on disc, narrower laterally and apically, 5th and 6th not or not much narrower than 4th on disc, 7th and 8th narrower, usually distinct but not strong, often somewhat interrupted but rarely disintegrated; crenulate intervals very narrow on disc, less strongly crenulate than in related forms, interval between 1st and 2nd costae reduced to a fine line almost without crenulations anteriorly. Aedeagus not dentate. Length 26-30; width *c.* 10.5-11.5 mm.

Holotype ♂ (M. C. Z. Type No. 30,347) and 67 paratypes all from the Eungella Range, *c.* 40 miles west of Mackay, Queensland, *c.* 2000-3000 ft. altitude, Nov. 1957, taken by my wife, my son, and myself, in rain forest.

For characters and relationships of this geographically isolated form, see preceding discussion and key.

PAMBORUS TROPICUS n. sp.

Form almost of *alternans*, slightly depressed; rather shining black, marginal channels and posterior impressions of pronotum and margins and crenulate intervals of elytra green. *Head*: neck constriction weak. *Prothorax* appearing as long as wide but by measurement nearly $\frac{1}{2}$ wider than long at middle; base not or slightly wider than apex; sides broadly rounded anteriorly, sometimes vaguely angulate at middle, broadly sinuate posteriorly; posterior angles projecting backward as usual in group; basal impressions uniting with marginal channels in moderate impressions, sometimes with vague convex areas reaching or nearly reaching base; each lateral margin with 1 to 4 seta-bearing punctures near and before middle (number variable, often asymmetrical). *Elytra* with margins not serrate; each elytron with 8 costae usually slightly narrower and more convex than in preceding forms especially externally, but 7th and 8th costae variable, sometimes distinct (but not strong), sometimes much interrupted or disintegrated; crenulate intervals narrow on disc, broader externally, strongly crenulate. Aedeagus not dentate. Length (types) 28-31; width 10.5-11.5 mm.

Holotype ♂ (M. C. Z. Type No. 30,348) and 30 paratypes all from Mt. Spec plateau (Paluma Range), about 40 miles north of Townsville, 2000-3000 ft. altitude, Nov.-Dec. 1957, taken by the Darlingsons, in or on the edges of rain forest. Additional specimens, not types: 5, Kirrama Range, 2000-3000 ft., Dec. 1957; 3, Millaa Millaa, April 1932; 2, Longlands Gap, Sept. 1952 (J. G. Brooks); 6, mountains above (SW of) Atherton, Dec. 1957 and Feb. 1958 (this and the 2 preceding localities are on the south-central Atherton Tableland); 6, Mt. Bartle Frere, west slope, 2000-3500 and 3000-5000 ft., Dec. 1957; and 1, Davies Creek Road, northern Atherton Tableland, May 1958; all specimens except Brooks' collected by the Darlingsons, in rain forest.

This species (or subspecies) is more like *subtropicus* of South Queensland than like *transitus* of the Eungella Range. It differs from *subtropicus* in having elytral costae usually slightly narrower and more convex especially externally, with 7th and 8th costae more often interrupted or disintegrated.

PAMBORUS OPACUS Gehin

Sloane (1904, p. 702) and Bänninger (1940) have applied the name *opacus* to this species. It differs from *tropicus* in being obviously duller, and it is also slightly more slender, with slightly narrower and more convex elytral costae, and on the average it has more marginal pronotal punctures, although these vary in number and position.

Although this species and *tropicus* are not very different structurally, I think they probably are real species, for they overlap geographically. Of *opacus*, I have 6 specimens from mountains north of Kairi, on the Atherton Tableland between the Atherton area and Davies Creek, taken in rain forest at close to 4000 ft. altitude, and 18 specimens from Mt. Lewis, near Mossman, taken at about 3000 ft. altitude in rain forest. My northernmost locality for *tropicus* is between these two places but at a somewhat lower altitude, near the southern end of the Davies Creek forestry road.

PAMBORUS ELEGANS Sloane

Sloane (1915) described this species from "scrub" (rain forest) east of Herberton on the Atherton Tableland. It should occur in the rain forests on the mountains between Atherton and Herberton, but I did not find it. Bänninger (1940) records

it from "Mac Ivor River," which may be the McIvor River north of Cooktown.

PAMBORUS PUNCTATUS n. sp.

Form as figured (Fig. 1); entirely dull bluish or purplish black. *Head* quadrate; eyes small; antennae short; neck constriction very deep. *Prothorax* $\frac{1}{3}$ or more wider than long at middle, widest behind middle, narrowed in front and behind

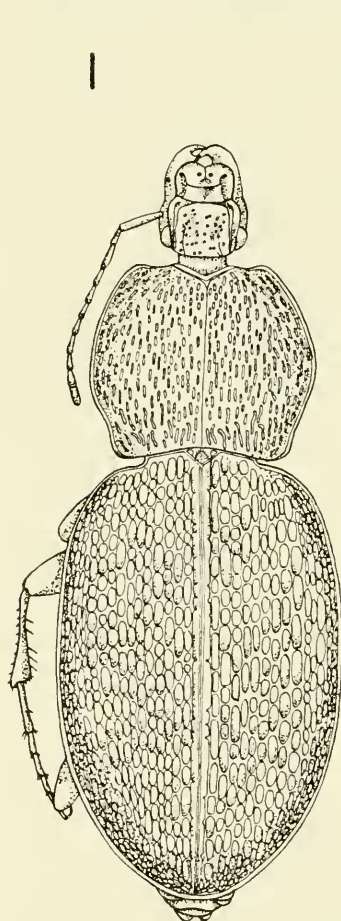


Fig. 1.

PAMBORUS PUNCTATUS n. sp.

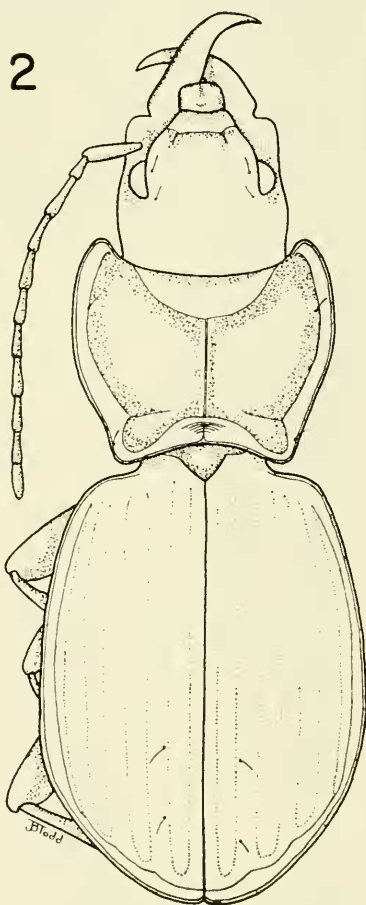


Fig. 2.

NURUS REX n. sp.

but base about $\frac{1}{3}$ wider than apex; sides weakly rounded except strongly rounded or vaguely angulate behind middle, slightly sinuate near base; basal angles only slightly produced backward; side margins thickened but marginal channels and basal impressions obsolete; dorsal surface almost evenly but not strongly convex, with middle line almost obsolete except anteriorly, and transverse impressions obsolete; whole surface coarsely, irregularly punctate with longitudinal, deep punctures. *Elytra* oval; humeri not serrate; each elytron with 15 distinct and 2 additional partial costae, all much interrupted, the outermost reduced to tubercles. Abdomen extensively but not uniformly punctate. Tip of last ventral segment subtruncate in male, broadly rounded in female. Aedeagus not dentate. Length 17-19.5; width 7.3-8.0 mm.

Holotype ♀ (M. C. Z. Type No. 30,349) and 2 paratypes from mountains above (SW of) Atherton, 3000-4000 ft. altitude, Dec. 1957 and Feb. 1958; and additional paratypes as follows: 1, south of Ravenshoe, c. 3000 ft., Feb. 1958; 2, east side Mt. Bellenden Ker, 3000-4500 ft., Dec. 1957. All specimens taken by myself in rain forest.

This species differs from all previously known *Pamborus* in obliteration of all pronotal impressions and in heavy punctation of pronotum. The small size and numerous elytral costae suggest a distant relationship with *P. guerini* Gory of South Queensland etc., but (in addition to the other differences) *guerini* has serrate humeri and *punctatus* has not.

In life this small *Pamborus* strikingly resembles the heavily catenulate species of *Notonomus* (especially *masculinus* Darl. 1953) which occur in the same rain forest areas. I suspect this is a case of mimetic convergence.

MYSTROPOMUS

Two species of this genus occur in tropical eastern Australia. One, with alternate elytral intervals raised, occurs in rain forest on the Eungella Range. It seems to be at most a poorly defined subspecies of *subcostatus* Chd. of South Queensland and New South Wales. I do not think it is worth naming. The other tropical species, with elytral intervals equal, is *N. regularis* Bänninger (1940), which occurs probably throughout the main (base-of-peninsular) rain forest system of North Queensland. I now have 113 specimens of it from localities north to

Thornton Peak and south to the Mt. Spec plateau. There is some geographical variation, but specimens from most localities can be referred to the typical subspecies. However, the form on the Mt. Spec plateau at the southern extreme of the species' range seems worth distinguishing as follows.

MYSTROPOMUS REGULARIS LAEVIS n. subsp.

Similar to large specimens of typical *Mystropomus regularis* Bänn. but almost lacking the weak granular elytral costae of typical *regularis*. In the latter each elytron has 6 or 7 distinguishable (though scarcely elevated) costae or stripes that are more shining than the intervening spaces. In the new subspecies only about the 4 inner stripes are indicated at all, and they are much less distinct than in the typical *regularis*. The rest of the elytral surface, including the lateral and anterior declivities, is virtually undifferentiated, dull, and finely granular. As compared with typical *regularis*, *laevis* also has slightly wider and more reflexed prothoracic margins and a somewhat duller pronotum. Length c. 17; width c. 6.5 mm.

Holotype ♂ (M. C. Z. Type No. 30,350) and 1 ♂ paratype both from Mt. Spec plateau (Pahuna Range), c. 40 miles north of Townsville, North Queensland, 2000-3000 ft. altitude, Feb. 1958, taken by myself in or on the edge of rain forest.

NURUS

This is a group of very large, stout Pterostichini that I cannot separate from *Trichosternus* by any single constant character except the relatively heavy build. *Nurus atlas* Cast. has each ♂ front tarsus slightly dilated, with only 2 segments squamulose, and most other *Nurus* have ♂ tarsi narrow and without squamae, but both these conditions exist in certain *Trichosternus*. Tschitschérine (1902) was therefore wrong in using form of ♂ tarsi as a primary generic character and Sloane (1894) was right in not using it. The known species of *Nurus* form several groups that have been called subgenera and that are named in the following key, although I am doubtful of the value of these subgenera.

Nurus sensu stricto includes about 4 species in northern New South Wales, south at least to near Ebor, and an additional

species on Mt. Tamborine in southeastern Queensland.¹ The majority of the species inhabit rain forest, but at least one extends into savannah woodland. The two species of *Pachymelas* apparently inhabit savannah woodland and perhaps coastal habitats in tropical Queensland; they do not seem to enter rain forest. The two previously described species of *Nuridius* are localized in South Queensland, probably in rain forest, although their habitats are not specified. The three new species described below, one tentatively associated with *Nuridius* and the others not assigned to subgenera, are all rain forest species, but they are not directly related among themselves and probably represent three separate invasions of isolated rain forests by different stocks of *Nurus*. The genus is apparently absent in the main (base-of-peninsular) rain forests of North Queensland.

Key to subgenera and some species of NURUS

1. Mesosternum not setose (*Nurus sensu stricto*) *c. 5 species*
- Mesosternum setose anteriorly 2
2. Humeri without teeth (*Pachymelas*) 2 species
- Humeri with margin toothed or thickened (but sometimes only slightly so) 3
3. Elytra without basal margin (*Nuridius*) 4
- Elytra with basal margin 5
4. Margins of pronotum less strongly reflexed; size smaller (31 & 39 mm.)
..... *fortis, grandis*
- Margins of pronotum strongly reflexed, size larger (41-45 mm.) ... *rex*
5. Wholly black; stout, prothorax transverse, not much narrowed behind
..... *nox*
- Greenish black; more slender, prothorax more narrowed behind
..... *medius*

NURUS REX n. sp.

Form as figured (Fig. 2); large; black, head and pronotum shining, elytra (except marginal intervals) dull, lower surface moderately shining. *Head* rather small (in genus), *c.* 2/3 width prothorax; mandibles long, straight basally, strongly

¹The type locality of *N. imperialis* (Sloane 1894) is given as "North Queensland," but the species really inhabits South Queensland. I have seen it only from Mt. Tamborine south of Brisbane. The type locality of *N. crassiformis* (Sloane 1899, p. 570) is given as "Cairns," but the specimen was received from French, and I know from other evidence that many of French's specimens have wrong localities. If *crassiformis* is a synonym of *atlas*, as supposed, the type presumably really came from northern New South Wales.

curved before apex, with irregular row of small seta-bearing punctures near lower edge of outer face near base; antennae short, extending only slightly beyond basal angles of prothorax; eyes small, genae long, wider than eyes, slightly, sinuously narrowed to neck; 2 supra-ocular setae each side; frontal impressions subparallel, irregular; mentum with deeply emarginate tooth. *Prothorax* cordate, 3/5 or slightly less wider than long at middle, strongly narrowed behind, less so in front; base slightly narrower than apex; latter broadly emarginate, with anterior angles abruptly advanced; base emarginate, posterior angles produced backward in are of emargination; sides rounded anteriorly broadly but usually not strongly sinuate well before base; basal angles would be right or slightly acute except narrowly rounded; lateral margins wide, very wide posteriorly, strongly reflexed, each with 1 or 2 seta-bearing punctures before middle and 1 or 2 also near base; base margined, apex not; disc with well impressed median line and transverse impressions; posterior impression and marginal channels joining in obliquely flattened baso-lateral areas; surface of disc slightly transversely wrinkled but not punctate, except extreme base at middle rugose-punctate with elongate punctures. *Elytra* broad, widest behind middle; humeri obtuse, with margins forming teeth which are strongly raised but hardly prominent laterally; base not margined (margins ending inwardly about opposite ends 5th striae); disc very convex; each elytron with 7 finely punctate striae lying in broad depressions between slightly elevated intervals; 9th interval with row of minute foveae (the 8th stria) along inner edge; no 10th interval; 7th interval scarcely raised at base; each 3rd interval 2-punctate posteriorly, usually near top of and well down on declivity, but position of punctures variable. Lower surface: prosternal process and anterior face of mesosternum setose; ventral segments 2 to 5 with some irregular setigerous punctation. Male tarsi not dilated, without squamae; ♂ usually with 1, ♀ 2 principal setae each side last ventral segment, but additional, usually smaller setae sometimes present. Length 41-45, width 15-17 mm.

Holotype ♂ (M. C. Z. Type No. 30,351) and 12 paratypes all from the Elliot Range, south of Townsville, Queensland, taken at about 3000 ft. altitude, March 2, 1958, by my son and myself, under logs in mountain rain forest.

See preceding discussion and key for place of this species among other *Nurus*.

NURUS NOX n. sp.

Large; black, moderately shining above and below except elytra duller with narrow bands along 8th striae (sometimes including margins) more shining. *Head* of moderate size (in genus), $\frac{3}{4}$ or slightly less width prothorax; mandibles rather long, strongly curved before apex, without setigerous punctures on lower outer face near base; antennae extending beyond base of prothorax by two or more segments; eyes small; genae subparallel, slightly sinuate but not much narrowed to neck; 2 supra-ocular setae each side; frontal impressions weak, subparallel, irregular; mentum with emarginate tooth. *Prothorax* transverse-subquadrate, slightly more than $\frac{1}{2}$ wider than long at middle, weakly narrowed behind; base about $\frac{1}{10}$ wider than apex; latter slightly emarginate, with anterior angles only slightly advanced; base broadly emarginate at middle, subtruncate at sides; base and apex unmarginated; sides arcuate anteriorly, then nearly straight and slightly converging posteriorly for much of length, then broadly and usually rather slightly sinuate before base; basal angles *c.* right but narrowly rounded; lateral margin moderate, slightly wider posteriorly, moderately reflexed, each with seta-bearing puncture near or a little before base but without anterior-marginal setae; disc with usual middle line and deeper transverse impressions; basal impression and marginal channels joining in what would be large baso-lateral impressions except each impression occupied by a large convex space; surface of disc slightly transversely wrinkled but not punctate, wrinkling much closer at sides and base, radiating from a central point near base. *Elytra* wide, not much narrowed anteriorly; humeri rounded, minutely obtusely toothed or at least slightly thickened at humeri (teeth or thickenings easily overlooked in dirty specimens); base margined almost to scutellum; disc very convex; each elytron with 7 vaguely indicated, sometimes finely punctate striae in depressions between slightly convex intervals; 9th interval (marginal channel) with an irregular series of small ocellate foveae on inner edge (= 8th stria); no 10th interval; 7th interval only slightly raised at base; each 3rd interval usually 2-punctate with punctures near top of and well down on declivity, but punctures variable in position and sometimes missing. Lower surface: prosternal process and anterior face of mesosternum setose; ventral segments 2 to 5 with setigerous punctures tending to form transverse rows. Male with front

tarsi not dilated, without squamae: male with 1 or 2, female with 2 or more principal setae each side last ventral segment, but setae variable, not always distinguishing sexes. Length 30-37; width 11.5-15 mm.

Holotype ♂ (M. C. Z. Type No. 30,352) and 7 paratypes (5 whole specimens and 2 represented by shells of prothorax and elytra) all from Mount Jacob, about 45 miles south of Gladstone, South Queensland, *c.* 2000 ft. altitude, March 1958, taken by the Darlingtons in and on the edges of rain forest.

This new species approaches *Pachymelas*, for the humeral "teeth" are small, obtuse, and inconspicuous, sometimes only slight thickenings of the margin, but the present species differs from the two known *Pachymelas* (both of which are before me) in a number of specific characters, including form of prothorax and presence of shining *submarginal* stripes on elytra.

NURUS MEDIUS n. sp.

Rather slender (in genus); greenish or bluish black, shining above except elytra duller with more or less shining sutural intervals and marginal channels, rather dull greenish below. *Head* large, $4/5$ or slightly less width prothorax, mandibles rather long, curved before apex, without setigerous punctures on lower edge of outer face; antennae relatively long, passing basal angles of prothorax by about 3 segments; eyes small, genae wider than eyes, broadly rounded, slightly narrowed to neck; frontal impressions weak, subparallel; mentum with emarginate tooth. *Prothorax* subcordate, between $1/3$ and $1/2$ wider than long at middle; sides weakly rounded anteriorly, straight and converging posteriorly behind middle, then broadly sinuate before right or slightly acute, scarcely blunted posterior angles; base about equal to or slightly narrower than apex; latter broadly emarginate at middle, slightly rounded at sides, with anterior angles (marginal channels) slightly advanced; base broadly emarginate, subtruncate at sides; base and apex unmarginated; lateral margins rather narrow (in genus) and not strongly reflexed, sometimes slightly scalloped, each with one seta before middle and another almost on posterior angle; disc with usual middle line, moderate anterior transverse impression, and deeper posterior transverse impression; latter ending in rather vague, irregular baso-lateral depressions which include somewhat transverse convexities near base; surface of disc slightly wrinkled, more wrinkled at base, the basal wrinkles

radiating irregularly from central point. *Elytra* rather strongly narrowed anteriorly, with obtuse humeri; latter with small but distinct teeth; basal margins entire; each elytron with 7 fine, faintly punctate striae in depressions between low, rounded intervals; 7th interval elevated at base but not acute; 3rd interval 2- or 3-punctate posteriorly, above and on declivity. Lower surface: prosternal process setose; mesosternum rather sparsely setose in fresh specimens, but seta sometimes hard to detect in old ones; ventral segments 2 to 5 with a few (variable) setigerous punctures tending to form transverse rows near middle of segments posteriorly. Male with front tarsi not dilated and without squamae; ♂ with 1, ♀ 2 setae each side last ventral segment. Length 30-37; width c. 11.5-14 mm.

Holotype ♂ (M. C. Z. Type No. 30,353) and 26 paratypes all from the Eungella Range, west of Mackay, Queensland, 2000-3000 ft. altitude, Nov. 1957, taken by the Darlingtons in rain forest.

This new species resembles *Nurus sensu stricto* in form and metallic coloration but differs in presence of setae on the mesosternum.

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